6.9.4

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

IN REPLY
REFER TO: OEA-095 August 25, 1999

MEMORANDUM

SUBJECT: Bunker Hill, CLP Metals Analysis, Data Validation
Case: 27105
SDG: MJAK44

FROM: Laura Castrilli, Chemist
Quality Assurance and Data Unit, OEA

TO: Mary Kay Voytilla, Regional Project Manager
Office of Environmental Cleanup

CC: Bruce Woods, Region 10 CLP TPO
Jim Stefanoff, CH2M Hill

The following is a validation of ICP-AES and mercury analyses of twelve dissolved water samples from the Bunker Hill project. The analyses were performed following the USEPA Contract Laboratory Program Statement of Work for Inorganics Analysis Multi-media, Multi-Concentration, ILM04.0. Analyses were conducted by Sentinel, Inc, of Huntsville, Alabama. This validation was conducted for the following samples:

MJAK44	MJAK46	MJAK48	MJAK50	MJAK52	MJAK54
MJAK45	MJAK47	MJAK49	MJAK51	MJAK53	MJAK55

Data Qualifications

The following comments refer to the Sentinel Laboratory's performance in meeting quality control specifications outlined in the *CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILM04.0.* The comments presented herein are based on the information provided for the review.

1.0 Timeliness - Acceptable

The technical (40 CFR part 136) holding time from the date of collection for mercury in water is 28 days. The holding time for the remaining metals in water is 180 days. The samples were collected on 06/18/99. Mercury analyses were completed on 07/03/99. ICP-AES analyses were completed on 07/13/99.

2.0 Sample Preparation - Acceptable

The samples were prepared for mercury and ICP-AES analyses on 07/02/99.

3.0 Calibrations/Calibration Verifications -

The samples were analyzed for mercury by CVAAS on 07/06/99. Initial calibration included one blank and six standards. The curve was linear with a correlation coefficient greater than 0.995.

The samples were analyzed by ICP-AES on 07/03/99 (main analyses) and 07/13/99 (lead analyses and iron, manganese and/or zinc ten, one hundred and one thousand fold dilutions). The instrument was standardized according to the analytical method each day of analysis using one blank and a single calibration standard for each element.

All ICP-AES and CVAAS (mercury) calibrations were performed as required and met the acceptance criteria; therefore, no qualification was made on this basis.

Continuing calibration verifications (CCVs) are required before and after sample analysis and after every 10 samples during analysis. Mercury recoveries must be within 80-120%. Other metal recoveries must be within 90-110%. The frequency of analysis of CCVs was met. All ICP-AES and CVAAS (mercury) CCVs (initial and continuing) bracketing reported sample results met the recovery criteria with the exception of iron (110.6%) and zinc (136.2%) in the second CCV (CCV2) of the main ICP analysis.

Since the iron recovery was so close to the acceptance criteria, no iron results were qualified on the basis of CCV recovery. The two samples analyzed just prior to this CCV had iron levels that required a one hundred fold dilution to report. Also for the two 'high' level samples, zinc required a one thousand fold and a one hundred fold dilution, respectively. The continuing calibration blank (CCB2) ran immediately after CCV2 showed evidence of carry over from both iron (33.2 ug/L) and zinc (83.7 ug/L).

There were only two reported zinc sample results (MJAK47 and MJAK49) that were bracketed by CCV2. Both samples were analyzed after CCV2/CCB2 but before CCV3/CCB3. The zinc recovery for CCV3 was acceptable while zinc was once again detected in CCB3. The zinc sample results were both greater than five times the largest associated blank level. In the reviewer's professional judgement, rejection of the reported zinc results due to the high zinc recovery for CCV2 is not necessary. The zinc results for MJAK47 and MJAK49 were qualified 'J' estimated (possible high bias due to carry over).

4.0 Laboratory Control Samples - Acceptable

Laboratory Control samples are digested and analyzed along with the

samples to verify the efficiency of laboratory procedures. All recoveries associated with reported sample results met the acceptance criteria.

5.0 Blanks -

Procedural blanks were prepared with the samples to show potential contamination from the digestion or analytical procedure. If an analyte was found in the associated blank, the sample results were qualified if the analyte concentration was less than five times the analytical value in the blank.

Beryllium was detected in the preparation blank. Barium, beryllium, iron, manganese, and zinc were detected in one or more ICP-AES continuing calibration blanks (CCBs). Mercury and silver had negative values with absolute values greater than the detection limit in the preparation blank and several CCBs. Sodium in one of the CCBs had a negative value with an absolute value greater than the detection limit. Based on blank contamination, associated sample results were qualified as follows:

- barium in samples MJAK47, MJAK51, and MJAK53 was qualified 'U'
- beryllium in samples MJAK47 and MJAK55 was qualified 'U'
- mercury in all samples was qualified 'UJ'
- silver in samples MJAK45 through MJAK47 and MJAK49 through MJAK52 was qualified 'J' or 'UJ'
- sodium in samples MJAK47, MJAK48, and MJAK50 was qualified 'J' or 'UJ'

All other sample results were greater than five times the associated blank levels (or were already undetected) and were not qualified based on blank contamination.

6.0 ICP-AES Interference Check Sample -

The interference check sample (ICS) is analyzed by ICP-AES to verify interelement and background correction factors. Analysis is required at the beginning and end of each sample analysis run and recoveries must be between 80% and 120%. All ICS recoveries associated with reported sample results were within the recovery criterion; with the exception of the zinc recovery (169%R, true value = 33 ug/L) in the second ICS-A analysis on 07/03/99. The ICS-AB recoveries for zinc were all acceptable (true value = 1008 ug/L). No zinc results were qualified based on the ICS-A recovery as all the zinc sample results were at levels closer to or greater than the ICS-AB zinc level.

The raw data for a number of samples had interfering levels of iron and/or manganese. Analytes for which iron and/or manganese is an interferent were qualified as follows:

- Aluminum in sample MJAK54 was qualified 'J', estimated (possible high bias due to suspected manganese interference). Aluminum in

sample MJAK55 was qualified 'UJ', estimated detection limit (possible false positive due to high manganese). Analyte equivalents in Table 2 of ILM04.0 were used to estimated the interference with aluminum due to manganese at levels > 50 mg/L.

- Chromium in samples MJAK46, MJAK51 and MJAK53 was qualified 'UJ', estimated detection limit (possible false positives due to high manganese). Analyte equivalents in Table 2 of ILM04.0 were used to estimated the interference with chromium due to manganese at levels > 50 mg/L.

- Vanadium in samples MJAK44 through MJAK46, MJAK48, and MJAK51 through MJAK53 was qualified 'UJ', estimated detection limit (possible false negatives due to high iron). Vanadium in all of the three ICS-A analyses bracketing these samples had negative results with absolute values greater than the detection limit.

Some of the samples required one or more dilution runs to report zinc, iron, and manganese results within the instrumental linear range. The raw data for all analytes were compared using the available dilutions to see if 1) zinc, iron, and/or manganese levels in the undiluted samples were high enough that interelement corrections may not be sufficient for the analytes that were reported from the undiluted

This review was limited to an assessment of just cadmium, iron, manganese, lead, and zinc results. Based on this evaluation, cadmium in samples MJAK45, MJAK46, and MJAK53 was qualified 'J' and manganese in sample MJAK45 was qualified 'J' estimated (evidence of suppression).

7.0 Duplicate Analysis - Acceptable

Duplicate analyses were done on sample MJAK44. Water duplicate results were within the ±20% Relative Percent Difference (RPD) or ±CRDL criteria for water results < 5 times the CRDL criteria. No qualification was made based on duplicate results.

8.0 Field Duplicate Analysis - Not Applicable

Field duplicate analysis for samples in this SDG was not indicated in the field collection documentation.

9.0 Matrix Spike Analysis -

Matrix spike sample analyses are done to provide information about the effect of the sample matrix on digestion and measurement methods. Matrix spike recovery must be within the limits of 75 - 125%.

Matrix spike analyses were done on sample MJAK44. All matrix spike recoveries were within the required QC limits, with the exception of antimony (72%) and silver (68%). All antimony and silver results were qualified 'J', estimated (possible low bias for results <u>not</u> qualified

due to blank contamination).

10.0 Graphite Furnace Atomic Absorption Spec (GFAAS) QC - Not Applicable -

GFAAS was not used for the analysis of these samples.

11.0 ICP-AES Serial Dilution -

Sample MJAK44 was analyzed by ICP-AES serial dilution to check for potential interferences. All analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within the 10%D criteria; with the exception of sodium (100%). All sodium results were qualified 'J', estimated due to the serial dilution result.

12.0 Detection Limits - Acceptable

Sample results which fall below the instrument detection limit (IDL) are assigned the value of the instrument detection limit and the 'U' qualifier is attached. Contract Required Detection Limit (CRDL) standards are required to demonstrate a linear calibration curve near the CRDL. CRDL standards were run at the required frequency.

13.0 Overall Assessment of the Data

This validation of the data is based on the criteria outlined in the *National Functional Guidelines for Inorganic Data Review (02/94)*. Approximately 25% of the data was qualified based on continuing calibration verification, blank contamination, interference, matrix spike recovery, or poor serial dilution results. The data as qualified is acceptable for all purposes.

Below are the definitions for the National Functional Guidelines for Inorganic Data Review (02/94) qualifiers used when validating/qualifying data from Inorganic analysis.

DATA QUALIFIERS

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J - The associated value is an estimated quantity.

R - The data are unusable. (Note: Analyte may or may not be present.)

UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK44

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27105 SAS No.: SDG No.: MJAK44

Matrix (soil/water): WATER Lab Sample ID: 21707S

Level (low/med): LOW Date Received: 06/19/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	25900			P
7440-36-0	Antimony	10.3	B	N J	P
7440-38-2	Arsenic	1130			P
7440-39-3	Barium	10.8	B		P
7440-41-7	Beryllium	6.0			P
7440-43-9	Cadmium	1560			P
7440-70-2	Calcium	59800			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	486			P
7440-50-8	Copper	2010			P
7439-89-6	Iron	639000			P
7439-92-1	Lead	397			P
7439-95-4	Magnesium	90800			P
7439-96-5	Manganese	108000			P
7439-97-6	Mercury	0.10	U	J	CV
7440-02-0	Nickel	393			P
7440-09-7	Potassium	1030	B		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	12.1		N J	P
7440-23-5	Sodium	7660		E J	P
7440-28-0	Thallium	14.9			P
7440-62-2	Vanadium	1.5	U	J	P
7440-66-6	Zinc	683000			P
	Cyanide				NR

06/23/99

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK45

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27105 SAS No.: SDG No.: MJAK44

Matrix (soil/water): WATER Lab Sample ID: 21708S

Level (low/med): LOW Date Received: 06/19/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	228000			P
7440-36-0	Antimony	127		~~N~~ J	P
7440-38-2	Arsenic	13000			P
7440-39-3	Barium	15.1	B		P
7440-41-7	Beryllium	29.5			P
7440-43-9	Cadmium	9350		J	P
7440-70-2	Calcium	156000			P
7440-47-3	Chromium	15.3			P
7440-48-4	Cobalt	2990			P
7440-50-8	Copper	15700			P
7439-89-6	Iron	9040000			P
7439-92-1	Lead	320			P
7439-95-4	Magnesium	215000			P
7439-96-5	Manganese	32700		J	P
7439-97-6	Mercury	0.10	U	J	CV
7440-02-0	Nickel	2180			P
7440-09-7	Potassium	169	B		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	0.70	U	~~N~~ J	P
7440-23-5	Sodium	232000		~~E~~ J	P
7440-28-0	Thallium	5.6	U		P
7440-62-2	Vanadium	1.5	U	J	P
7440-66-6	Zinc	13500000			P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK46

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27105 SAS No.: SDG No.: MJAK44

Matrix (soil/water): WATER Lab Sample ID: 21709S

Level (low/med): LOW Date Received: 06/19/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	118000			P
7440-36-0	Antimony	61.6		~~N~~ J	P
7440-38-2	Arsenic	4370			P
7440-39-3	Barium	9.1	B		P
7440-41-7	Beryllium	18.7			P
7440-43-9	Cadmium	4630		J	P
7440-70-2	Calcium	74600			P
7440-47-3	Chromium	11.2		UJ	P
7440-48-4	Cobalt	1540			P
7440-50-8	Copper	9390			P
7439-89-6	Iron	3010000			P
7439-92-1	Lead	557			P
7439-95-4	Magnesium	178000			P
7439-96-5	Manganese	420000			P
7439-97-6	Mercury	0.10	U	J	CV
7440-02-0	Nickel	1070			P
7440-09-7	Potassium	620	B		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	0.70	U	~~N~~J	P
7440-23-5	Sodium	71600		~~E~~J	P
7440-28-0	Thallium	86.7			P
7440-62-2	Vanadium	1.5	U	J	P
7440-66-6	Zinc	2660000			P
	Cyanide				NR

mg/kg

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK47

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27105 SAS No.: SDG No.: MJAK44

Matrix (soil/water): WATER Lab Sample ID: 21710S

Level (low/med): LOW Date Received: 06/19/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1060			P
7440-36-0	Antimony	2.1	U	~~N~~ J	P
7440-38-2	Arsenic	12.6			P
7440-39-3	Barium	5.6	~~B~~	U	P
7440-41-7	Beryllium	0.72	~~B~~	U	P
7440-43-9	Cadmium	0.40	U		P
7440-70-2	Calcium	3920	B		P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	8.9	B		P
7440-50-8	Copper	4.2	B		P
7439-89-6	Iron	17400			P
7439-92-1	Lead	37.3			P
7439-95-4	Magnesium	1960	B		P
7439-96-5	Manganese	2270			P
7439-97-6	Mercury	0.10	U	J	CV
7440-02-0	Nickel	5.9	B		P
7440-09-7	Potassium	814	B		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	0.70	U	~~N~~ J	P
7440-23-5	Sodium	632	B	~~E~~ J	P
7440-28-0	Thallium	5.6	U		P
7440-62-2	Vanadium	1.5	U		P
7440-66-6	Zinc	635		J	P
_____	Cyanide				NR

06/23/99

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK48

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27105 SAS No.: SDG No.: MJAK44

Matrix (soil/water): WATER Lab Sample ID: 21711S

Level (low/med): LOW Date Received: 06/19/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10300			P
7440-36-0	Antimony	2.1	U	~~N~~J	P
7440-38-2	Arsenic	238			P
7440-39-3	Barium	29.6	B		P
7440-41-7	Beryllium	2.1	B		P
7440-43-9	Cadmium	595			P
7440-70-2	Calcium	123000			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	229			P
7440-50-8	Copper	771			P
7439-89-6	Iron	185000			P
7439-92-1	Lead	707			P
7439-95-4	Magnesium	137000			P
7439-96-5	Manganese	98600			P
7439-97-6	Mercury	0.10	U	J	CV
7440-02-0	Nickel	198			P
7440-09-7	Potassium	3990	B		P
7782-49-2	Selenium	3.8	B		P
7440-22-4	Silver	16.4		~~N~~J	P
7440-23-5	Sodium	104	U	~~E~~J	P
7440-28-0	Thallium	8.8	B		P
7440-62-2	Vanadium	1.5	U	J	P
7440-66-6	Zinc	242000			P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK49

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27105 SAS No.: SDG No.: MJAK44

Matrix (soil/water): WATER Lab Sample ID: 21712S

Level (low/med): LOW Date Received: 06/19/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	30.2	B		P
7440-36-0	Antimony	2.1	U	~~N~~ J	P
7440-38-2	Arsenic	4.2	U		P
7440-39-3	Barium	90.5	B		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	20.6			P
7440-70-2	Calcium	18900			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	13.8	B		P
7440-50-8	Copper	8.9	B		P
7439-89-6	Iron	1610			P
7439-92-1	Lead	768			P
7439-95-4	Magnesium	45400			P
7439-96-5	Manganese	12700			P
7439-97-6	Mercury	0.10	U	J	CV
7440-02-0	Nickel	18.4	B		P
7440-09-7	Potassium	1320	B		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	1.9	B	~~N~~ J	P
7440-23-5	Sodium	1000	B	~~E~~ J	P
7440-28-0	Thallium	5.6	U		P
7440-62-2	Vanadium	1.5	U		P
7440-66-6	Zinc	3650		J	P
_____	Cyanide				NR

7/20 08/03/99

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK50

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27105 SAS No.: SDG No.: MJAK44

Matrix (soil/water): WATER Lab Sample ID: 21713S

Level (low/med): LOW Date Received: 06/19/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1920			P
7440-36-0	Antimony	2.1	U	~~N~~ J	P
7440-38-2	Arsenic	13.8			P
7440-39-3	Barium	19.4	B		P
7440-41-7	Beryllium	1.3	B		P
7440-43-9	Cadmium	178			P
7440-70-2	Calcium	14300			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	24.3	B		P
7440-50-8	Copper	48.4			P
7439-89-6	Iron	50500			P
7439-92-1	Lead	572			P
7439-95-4	Magnesium	23200			P
7439-96-5	Manganese	21600			P
7439-97-6	Mercury	0.10	U	J	CV
7440-02-0	Nickel	25.1	B		P
7440-09-7	Potassium	827	B		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	4.8	B	~~N~~ J	P
7440-23-5	Sodium	104	U	~~E~~ J	P
7440-28-0	Thallium	5.6	U		P
7440-62-2	Vanadium	1.5	U		P
7440-66-6	Zinc	70000			P
_____	Cyanide				NR

AC 8/23/99

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK51

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27105 SAS No.: SDG No.: MJAK44

Matrix (soil/water): WATER Lab Sample ID: 21714S

Level (low/med): LOW Date Received: 06/19/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	43000			P
7440-36-0	Antimony	22.6	B	~~N~~J	P
7440-38-2	Arsenic	2000			P
7440-39-3	Barium	4.1	~~B~~	U	P
7440-41-7	Beryllium	8.2			P
7440-43-9	Cadmium	2880			P
7440-70-2	Calcium	129000			P
7440-47-3	Chromium	1.4	~~B~~	UJ	P
7440-48-4	Cobalt	921			P
7440-50-8	Copper	4290			P
7439-89-6	Iron	927000			P
7439-92-1	Lead	606			P
7439-95-4	Magnesium	115000			P
7439-96-5	Manganese	129000			P
7439-97-6	Mercury	0.10	U	J	CV
7440-02-0	Nickel	776			P
7440-09-7	Potassium	629	B		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	0.70	U	~~N~~J	P
7440-23-5	Sodium	24700		~~E~~J	P
7440-28-0	Thallium	24.6			P
7440-62-2	Vanadium	1.5	U	J	P
7440-66-6	Zinc	1070000			P
	Cyanide				NR

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK52

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27105 SAS No.: SDG No.: MJAK44

Matrix (soil/water): WATER Lab Sample ID: 21715S

Level (low/med): LOW Date Received: 06/19/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	26500			P
7440-36-0	Antimony	10.8	B	~~N~~ J	P
7440-38-2	Arsenic	1090			P
7440-39-3	Barium	10.7	B		P
7440-41-7	Beryllium	5.5			P
7440-43-9	Cadmium	1550			P
7440-70-2	Calcium	58300			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	485			P
7440-50-8	Copper	2070			P
7439-89-6	Iron	632000			P
7439-92-1	Lead	396			P
7439-95-4	Magnesium	91500			P
7439-96-5	Manganese	107000			P
7439-97-6	Mercury	0.10	U	J	CV
7440-02-0	Nickel	389			P
7440-09-7	Potassium	1140	B		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	5.0	B	~~N~~J	P
7440-23-5	Sodium	8680		~~E~~J	P
7440-28-0	Thallium	13.3			P
7440-62-2	Vanadium	1.5	U	J	P
7440-66-6	Zinc	687000			P
	Cyanide				NR

08/03/99

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK53

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27105 SAS No.: SDG No.: MJAK44

Matrix (soil/water): WATER Lab Sample ID: 21716S

Level (low/med): LOW Date Received: 06/19/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	38100			P
7440-36-0	Antimony	14.6	B	~~N~~ J	P
7440-38-2	Arsenic	1950			P
7440-39-3	Barium	2.8	~~B~~	U	P
7440-41-7	Beryllium	7.5			P
7440-43-9	Cadmium	1720		J	P
7440-70-2	Calcium	43600			P
7440-47-3	Chromium	2.3	~~B~~	UJ	P
7440-48-4	Cobalt	630			P
7440-50-8	Copper	4200			P
7439-89-6	Iron	856000			P
7439-92-1	Lead	341			P
7439-95-4	Magnesium	70800			P
7439-96-5	Manganese	110000			P
7439-97-6	Mercury	0.10	U	J	CV
7440-02-0	Nickel	469			P
7440-09-7	Potassium	192	B		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	6.7	B	~~N~~ J	P
7440-23-5	Sodium	6300		~~E~~ J	P
7440-28-0	Thallium	19.3			P
7440-62-2	Vanadium	1.5	U	J	P
7440-66-6	Zinc	603000			P
_____	Cyanide				NR

dlc 08/03/99

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK54

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27105 SAS No.: SDG No.: MJAK44

Matrix (soil/water): WATER Lab Sample ID: 21717S

Level (low/med): LOW Date Received: 06/19/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	364		J	P
7440-36-0	Antimony	2.1	U	~~NJ~~	P
7440-38-2	Arsenic	63.3			P
7440-39-3	Barium	24.5	B		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	55.6			P
7440-70-2	Calcium	216000			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	107			P
7440-50-8	Copper	34.6			P
7439-89-6	Iron	35900			P
7439-92-1	Lead	308			P
7439-95-4	Magnesium	195000			P
7439-96-5	Manganese	118000			P
7439-97-6	Mercury	0.10	U	J	CV
7440-02-0	Nickel	111			P
7440-09-7	Potassium	6650			P
7782-49-2	Selenium	8.5			P
7440-22-4	Silver	28.4		~~NJ~~	P
7440-23-5	Sodium	1080	B	~~BJ~~	P
7440-28-0	Thallium	19.8			P
7440-62-2	Vanadium	1.5	U		P
7440-66-6	Zinc	33800			P
_____	Cyanide				NR

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJAK55

Lab Name: SENTINEL INC. Contract: 68-D6-0001

Lab Code: SENTIN Case No.: 27105 SAS No.: SDG No.: MJAK44

Matrix (soil/water): WATER Lab Sample ID: 21718S

Level (low/med): LOW Date Received: 06/19/99

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	90.0	~~B~~	UJ	P
7440-36-0	Antimony	2.1	U	~~N~~J	P
7440-38-2	Arsenic	4.2	U		P
7440-39-3	Barium	9.0	B		P
7440-41-7	Beryllium	0.24	~~B~~	U	P
7440-43-9	Cadmium	72.3			P
7440-70-2	Calcium	113000			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	71.1			P
7440-50-8	Copper	28.8			P
7439-89-6	Iron	666			P
7439-92-1	Lead	1070			P
7439-95-4	Magnesium	554000			P
7439-96-5	Manganese	219000			P
7439-97-6	Mercury	0.10	U	J	CV
7440-02-0	Nickel	101			P
7440-09-7	Potassium	3210	B		P
7782-49-2	Selenium	30.1			P
7440-22-4	Silver	58.3		~~N~~J	P
7440-23-5	Sodium	2210	B	~~E~~J	P
7440-28-0	Thallium	59.7			P
7440-62-2	Vanadium	1.5	U		P
7440-66-6	Zinc	44500			P
_____	Cyanide				NR

08/03/99

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Comments: